Real-Time GIS and IOT for Public Safety: A Business Process Model

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Abstract

Background: Public safety is the most important task facing various industries. It aims to (i) prevent emergencies caused by hazards and (ii) to respond in emergency situations. Reducing hazard loss to humans and property will result in reducing cost. Imagine a gas company; hurricane, gas leak, and earthquake are considered as hazards and risks to field crews, customers, gas utilities assets, and services.

Needs: There are two important and necessary requirements: (i) improve situational awareness and (ii) make proper actions in real-time. Situational awareness enables the dispatcher to *continuously* monitor the environment and recognize (perceive) any risk or emergency situation in real-time. *In real-time*, the dispatcher needs to know who (my field crews and customers) and what (my gas utilities assets) are exposed to high risk (danger), what risk, and where? These actions may result in the dispatcher needing to *quickly and efficiently* notify the field crews, warn the customers, select and assign nearest first responders, select gas valves to shut off, etc.

Solution: Our solution is based on real-time GIS and Internet of Things (IOT). This paper presents a business process model (BPM) of this solution. BPM is used to develop an autonomous and intelligent software system for public safety. Our insight is to access and connect a network of sensors, gather real-time data, perform risk estimation models, execute problem-solving algorithms, and share information as web map services (e.g. web map services) in real-time. This solution enables us to develop any operational dashboard for dispatchers and mobile app for field crews and customers.

Method: We used the BPMN (Business Process Model and Notation) to design our solution. We then designed a system architecture of our solution. C#.NET, ArcGIS runtime SDK, and enterprise geodatabase are used within the system development.

Finding: The gas company will reduce costs and increase operational efficiency and effectiveness using our solution. Our solution provides a configurable and flexible platform for various industries (e.g. disaster emergency management, crisis response system, NG-911) to address emergencies and new needs and requirements they may face.

Biography:

Reza Nourjou holds a Ph.D. in Informatics, a master degree in GIS, and a certification of Human Security Engineering from Disaster Prevention Research Institute of Kyoto University with +10 years of experience in the field. His expertise includes: GIS Software Development (C#.NET, esri ArcGIS), Real-Time GIS, Internet of Things, Multi-Agent Systems and Autonomous Software Agents, and Public Safety and Smart Utilities. He published more than 20 scholarly papers, and he is a program committee member in ACM and IEEE conferences. Currently, he is a GIS Consultant at Infosys, Atlanta USA.

Sahadeb De is a software engineer and GIS professional, both by training, having more than 25 years of cumulative experience in academia and industry in the fields of geoenvironment, natural resources, agriculture, electric and gas utility. Currently he is working at Infosys Ltd. as a Principal Consultant (GIS) where he engages with the client to consult on the GIS business and technical processes.